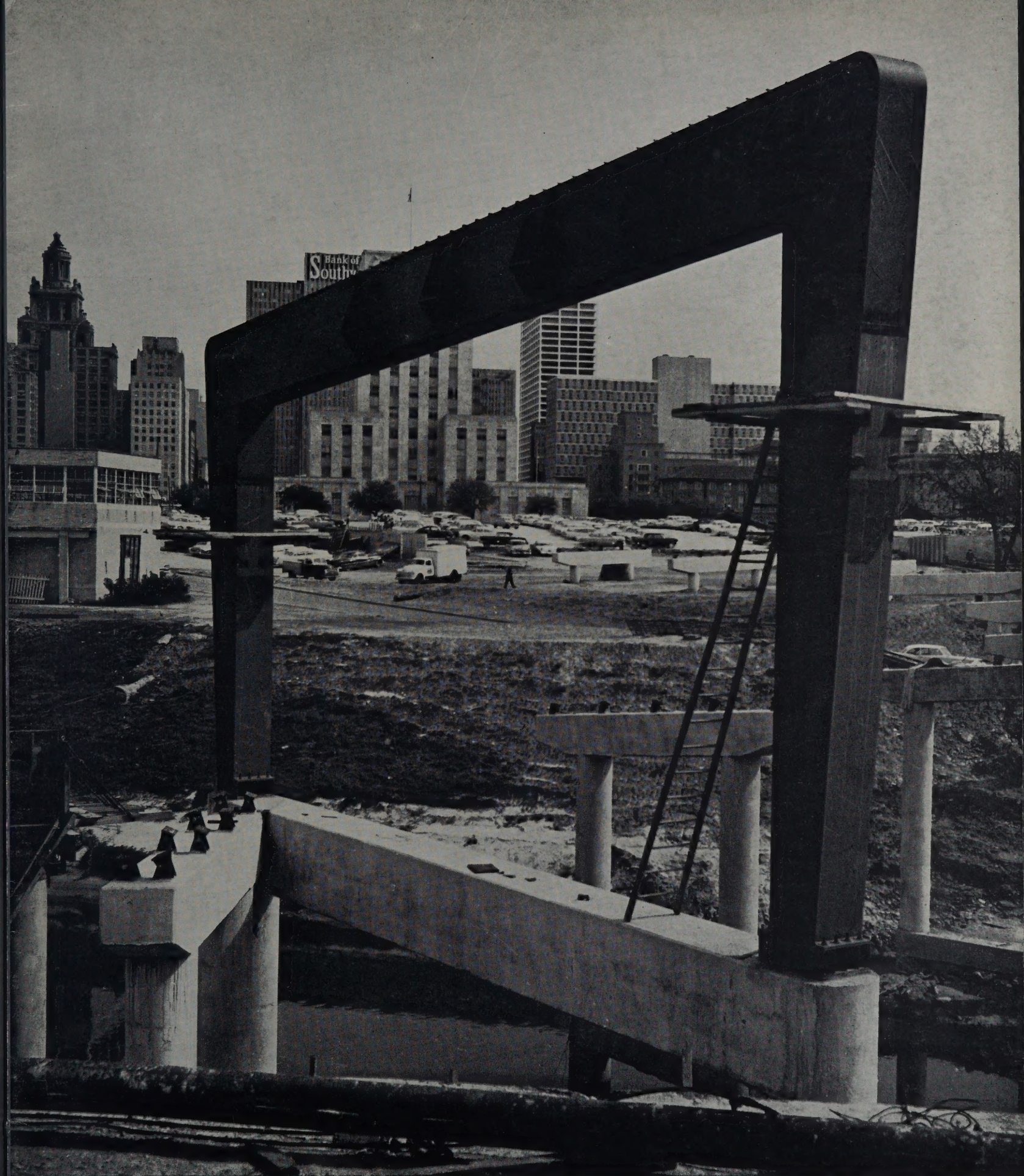

Texas Highways

May, 1961 35c

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Four Decades of Highway Development

N. A. Billingsley Jr., Senior Laboratory Engineer
District 8

The days of the Model T brought the necessity for improving roads from the horse and buggy trails of the turn of the century. As automobiles improved, the need for new construction in highways was evident—each a challenge to the other.

One of the few remaining sites where the transition from early to modern-day highways is visible is in the Iatan Flat country about twenty miles east of Big Spring in West Texas.

Interstate Highway 20 now stretches across the rolling ranch country where just 40 years ago the only roads were of the primitive, two-rut variety.

This era of highway progress started in 1921 when a section of Old Highway 1 (also known as the Bankhead Highway and later designated U. S. 80) was let for contract. The design provided for a sixteen-foot-wide roadbed within 100 feet of the right of way.

The pavement structure consisted of six to eight inches of caliche base and one-half inch of asphalt surface.

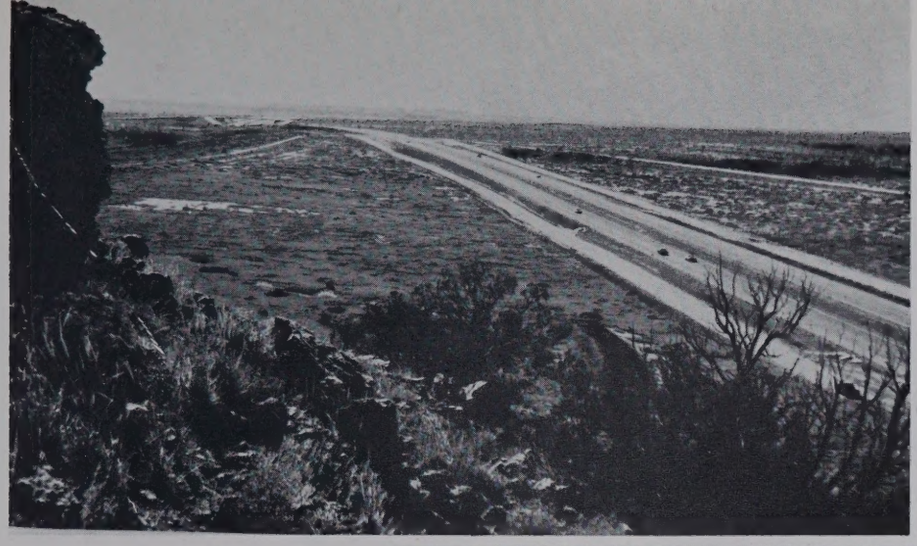
The second stage of development was completed in June, 1936, just in time for the Texas Centennial. This improvement project included the building of an overpass over the T & P Railroad, along with the widening of the asphalt surface to 22 feet.

Crews worked day and night to complete the highway so travelers could use it en route to the Centennial Exposition in Dallas. Thus it became known as the Centennial Project.

The Federal Highway Act of 1956 provided for a modern, controlled-access, divided four-lane highway to be built across this ranch country, linking towns and cities along U. S. 80. The most recent stage of development was completed in 1958 in accordance with this Act.

The new look comprises two lanes of 24-foot surface and paved shoulders divided by approximately 40 feet. Also, modern grade separations, controlled-access entrance and exit ramps with accompanying frontage roads are provided where needed within the 260-foot right of way.

This modern facility will serve local residents as well as tourists for many years to come.

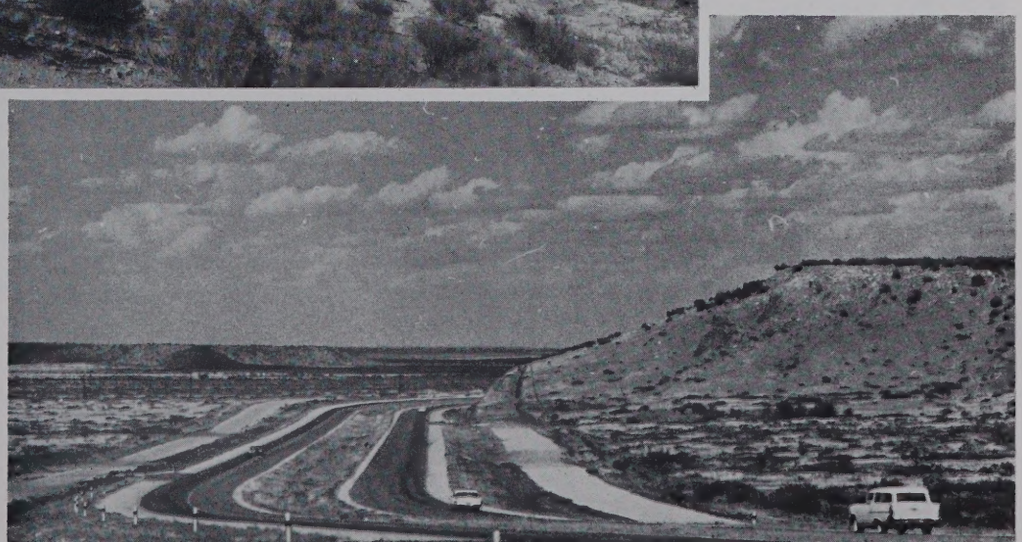


Three stages of highway development here show Interstate Highway 20, center, completed in 1958 —bounded by U. S. 80, far left, built in 1936; and U. S. Highway 1, left, built in 1921-23.

A glance at the past— U. S. Highway 1.

Here is the Centennial highway of 1936.

Interstate 20—a look into the future.



improved CENTER-STRIPE procedure

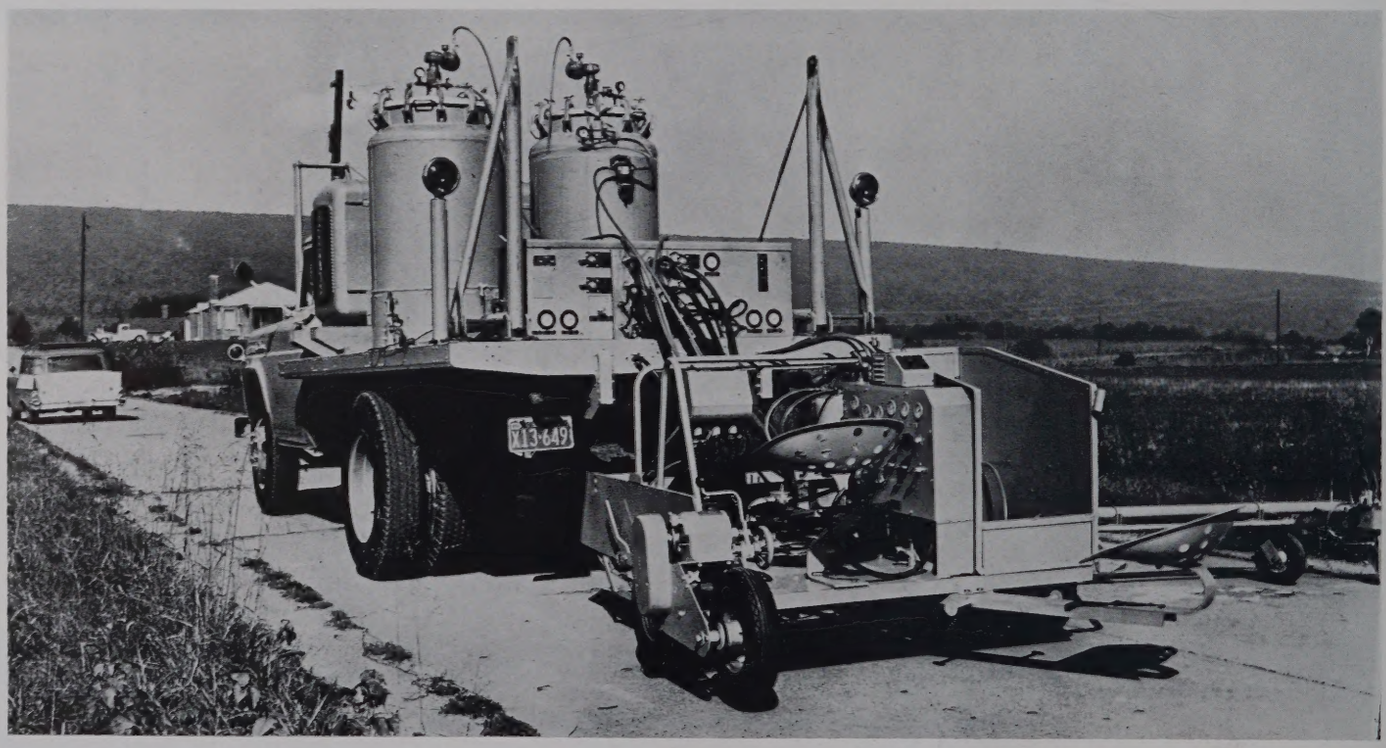
Since the Texas Highway Department switched over from asphalt pavement marking to paint, the districts have been using an electrically powered paint conditioner, with power supplied at the warehouse and all paint mixed there.

Recently, writes Adrian C. Pluckhahn, Sign Supervisor in District 23, with the use of a 110-volt, 2000-watt, gasoline-powered generator, District 23 has made this power available in the field for on-the-job use. This has greatly increased the efficiency of striping operations, and has eliminated one man from the paint crew.

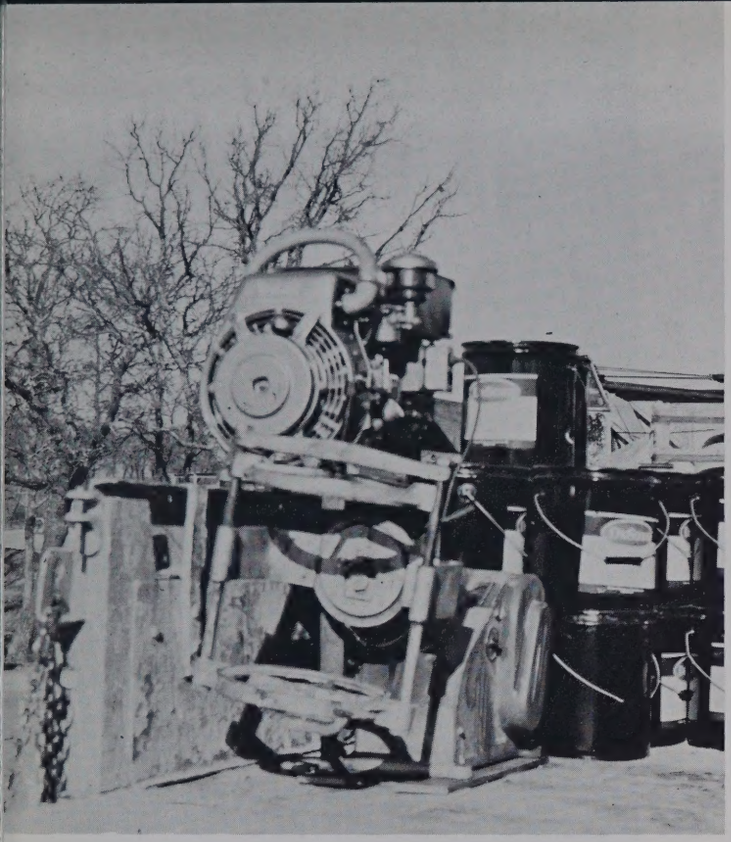
Says Pluckhahn, "Since adding a paint heater to our striping machine, we find it unnecessary to open our buckets of paint and add thinner." (Here, D-18 explains, heat, which is furnished by a water-cooled air compressor and thermostatically controlled, substitutes for thinner as a viscosity-reducing agent.)

According to D-18, there are other advantages to this innovation. The paint heater permits: 1) constant control over viscosity, regardless of weather conditions; 2) better control of film thickness in application; and 3) faster drying on highways. Previously, thinner had to completely evaporate before stripes dried.

Pluckhahn concludes, "We have found this very satisfactory, as one man can keep up with the operation, giving us better material with less manpower."

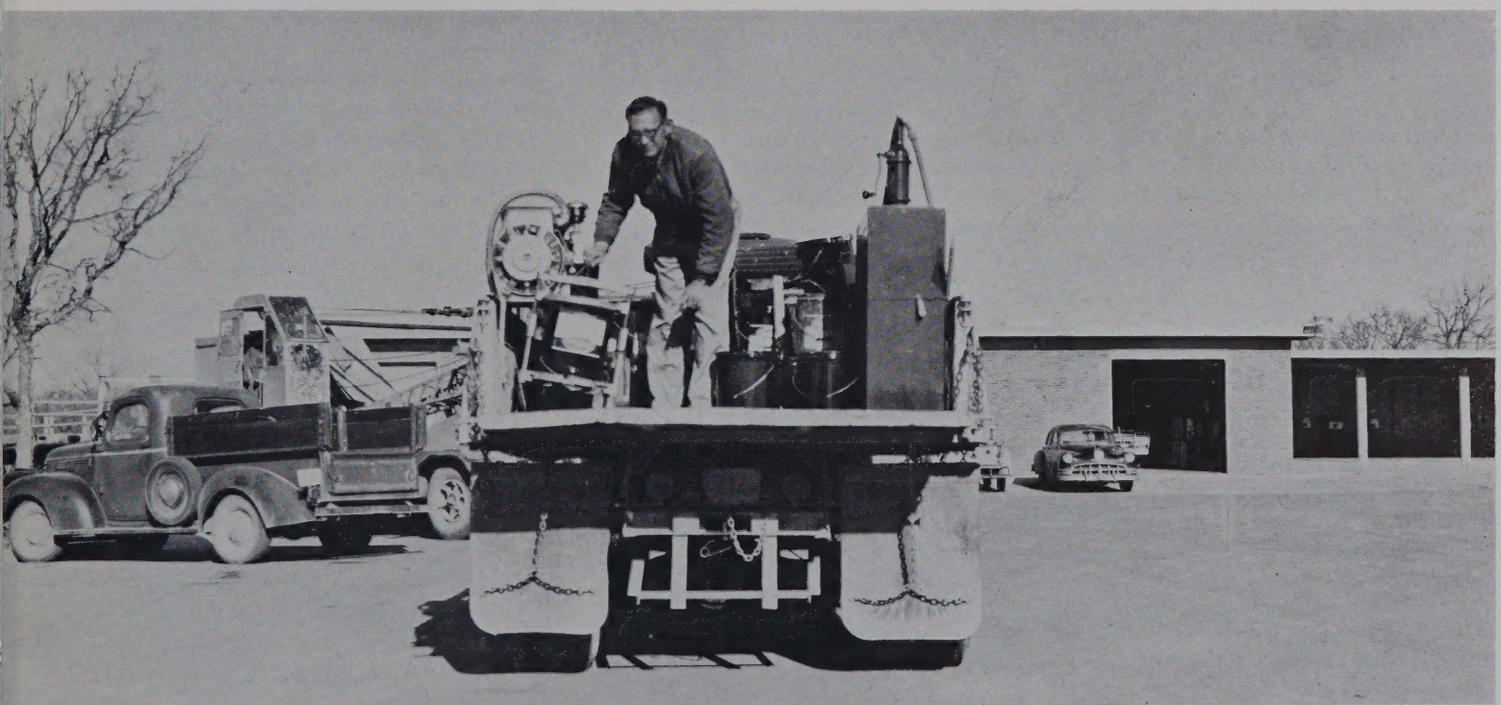


Here is the striping machine with its newest modification—a paint heater. Installed on the back of the striping truck, it can heat two colors simultaneously. Thus, paint flows smoothly from the two tanks on the cab to the three spray guns (a jet for white paint is flanked by two yellow-spraying guns) beneath the trailer via insulated tubes. The tubes are connected to the main control panel which also includes two pilot lights. One indicates when the unit is turned on, and the other, when the paint is at spraying temperature (110 degrees Fahrenheit maintains good viscosity).



The two rotary cams in the center of paint conditioner shown here produce the motion which mixes the paint and thinner into an applicable state. After being shaken, the paint may remain in suspension for twelve hours. If unused within this period, it is reshaken.

Before paint is poured into storage tanks for use in striping operations, it must be thoroughly shaken. Skilled Laborer Luther Coffman stands by while this is done. The can is placed in the conditioner upside down to loosen any pigment settled at the bottom.

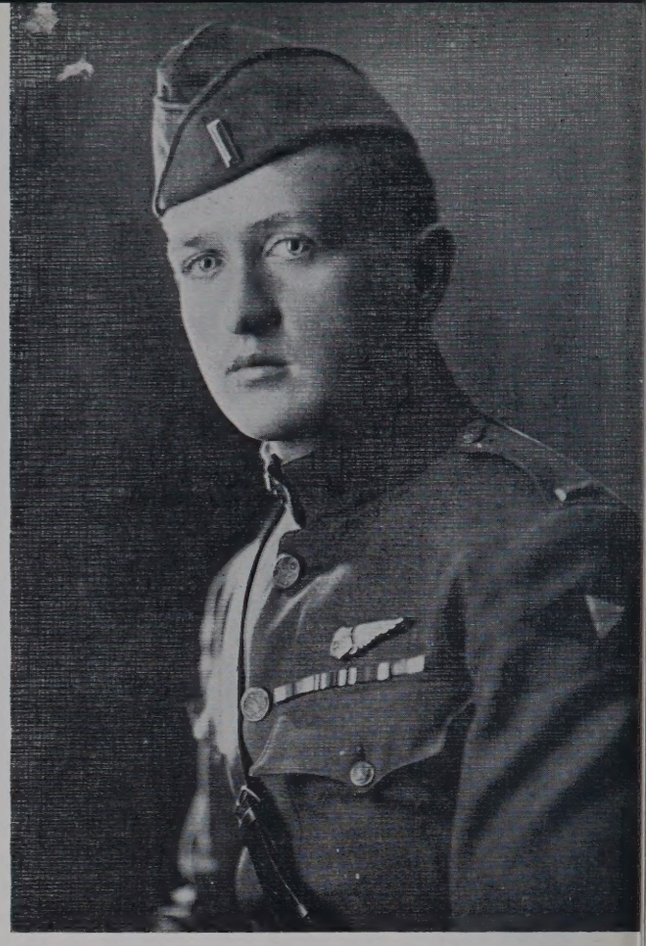


Getting ready to unclamp the five-gallon can from the conditioner and stack it alongside the others, is Adrian C. Pluckhahn, Sign Supervisor.

The Highway Department and Willie Duval

they've come A Long Way Together

Jim Davis
Travel and Information Division



Willie Duval wore the wings of the Air Service during World War I. A graduate of the First Officers Training Camp at Leon Springs, he transferred from the Field Artillery to the Air Service.

Part of an era ended in the Texas Highway Department on the day Willie Duval left his desk for the last time.

It was on the last day of February—the day before his sixty-fifth birthday—that Willie Duval retired after 41 years' service with the Department, the last ten as Senior Designing Engineer in the Highway Design Division.

He was one of the few still left who remember what the Highway Department was like in the old days—the *really* old days. He had been with the Department almost since the beginning, and his own engineering career paralleled the rise to respect and achievement of the organization for which he worked so long.

Willie Duval first started to work for the Highway Department on February 16, 1920. Before many present-day Department employees were even born, he was an experienced engineer wrestling with the problems of getting Texas out of the mud, working along with the handful of other trail-blazing engineers with whom he started.

He saw the Highway Department take its first tentative, uncertain steps in the then-new field of highway design and construction, much like a child learning to walk.

He saw the chaotic early years, when a storm of misguided public criticism jeopardized the very existence of the Department, when highway employees worked in offices scattered throughout half of Austin.

He saw the years of political upheaval, when a man might come to work in the morning to find a stranger occupying his desk—a result of the prevailing political custom, "to the victor belong the spoils."

And he has seen the good years, when decades of hard work and engineering achievements resulted in widespread public acceptance and admiration, as the Texas Highway Department became one of the best organizations of its kind in the world.

Willie Duval saw it all, almost from the beginning. Of the Department employees who were there when he started, to his recollection only five remain: Bessie Bergstrom of D-11, Erin Bradfield of D-21, D. H. Askew of D-18, C. S. Kinney of D-8, and Freda Swiedom of D-12.

Strangely, the man who was to work four decades for the Texas Highway Department was not born a Texan. Eston William Duval was born in Houma, Louisiana, on March 1, 1896. He attended Terrebonne High School, and later studied architecture and engineering at Rice University in Houston (it was Rice Institute then) and at the University of Texas in Austin.

He grew to manhood just in time for World War I, and went to the

First Officers Training Camp at Leon Springs north of San Antonio (it is now Camp Bullis). Second Lieutenant E. W. Duval was a member of the Field Artillery, 90th Division, until he volunteered for the Air Service, which was under the Signal Corps.

For two years he served as an aerial observer in France, taking pictures from the air, directing artillery fire via primitive radio contact with the ground, and sending signals by Morse code. As a member of the 88th and 1st Aero Squadrons, he flew countless hours over enemy lines in airplanes which now, as museum pieces, are looked on as "flying firetraps" and "crates."

(If Willie Duval was a symbol of his generation as an adventurous young airman, he is representative of that generation also in a sadder way. His son, Billy Duval, grew to manhood just in time for World War II, and was killed on a raid over the infamous Ploesti oil fields while serving as a bombardier in a heavy bomber.)

After college, he went to work as a Draftsman in the Austin office of the fledgling Highway Department. At this time the Department consisted of only a handful of engineers and draftsmen whose purpose was to "get Texas out of the mud." The Department had been formed only three years before, and was still struggling to get on its feet.

In those days Willie Duval came to work on a bicycle. The Department offices were on the second floor of the Land Office Building, and there was a blueprint machine in the basement. The site of the present State Highway Building was then the county jail.

R. J. Windrow was the State Highway Engineer. He had replaced George Duran, who had held that position when the Department was created in 1917. There were only four Highway Districts, compared with 25 now.

This was just after the legendary racing driver, Barney Oldfield, had made 60 miles per hour in a racing car. "People could hardly believe that a car could go at that speed," Duval recalled. "There were lots of wagons and buggies, but few cars. In 1920 cars drove at about 15 miles an hour but by 1925 their speed had increased and from then on, it was a race to keep the highways up with automobile development."

Texas "highways" were not yet worthy of the name. Roads were gravel and caliche, with an occasional stretch of tar-topped riding surface. Every road was a turtle-back with a high crown which sloped to each side. To drive on this surface, cars literally had to straddle the middle of the road. When two cars met, the roads were so narrow that one car would have to pull onto the right of way to let the other pass. The roads were full of disastrous "chugholes" because there was no control over the base.

Texas highway engineers set out to get rid of these disadvantages. The excessive highway crown was widened and Duval recalled that Texas was the first state to use wide, flat ditches.

In the 1920's there were no highway signs. "At a crossroads," Duval said, "a driver wouldn't know which way to turn. It was 1930 before a real signing program was underway." By this time Duval was Chief Draftsman and was supervising the work of 100 men.

"At first, the Highway Department didn't have money to build what it wanted to," Duval said. He pointed to wooden bridges as an example. "High water was dangerous, and ferries handled many major river crossings. Sometimes it took four or five hours to cross." By the early 1930's, he added, the Highway Department had more money and began to build steel bridges.

Among the major improvements made during these times in highway design, Duval listed the thickening of the highway base to provide a more durable and smoother riding surface; widening of the surface so that two cars meeting head-on could pass without either having to pull off to the side of the road; the use of concrete pavement to improve the riding characteristics of the road; and turnouts for one-way bridges.

"The University of Texas used the data we got together in highway design to train young engineers," Duval recalled. "We were as advanced

On his final work day, his division gave Willie a party, and presented him a plaque—"Throughout your four decades of service (1920-1961) with the Highway Department you have earned the professional respect and the warm personal regards of all with whom you have worked. "On this occasion of your retirement from the Department we wish to recognize your contributions to the field of highway engineering and to express our deep affection for you as a friend."

Willie left the Department armed with equipment for the future. Co-workers gave him a rod, a tackle box, and fishing boots. Now he's set to begin his new career.

With mixed thoughts—reminiscences of the past and plans for the future—Willie has a final cup of state-time coffee with the boys at his "going out" party.

as anybody in the country. We started from scratch and developed new design methods. Texas has always been a leader in this field."

Problems faced by the Highway Department were not always of a technical aspect. Engineering tenure more often depended on political favor than on skill. During the time the Fergusons were in power at the State Capitol, Duval said, "they fired everybody but the ones in Highway Design—and they had to have them to get Federal Aid."

"The ax cut everybody off. You'd come to work one morning and there'd be someone sitting in your place. Just like that."

But during the administration of Governor Ross Sterling, Duval said, for the first time the terms of the Highway Commissioners were staggered. The Texas Highway Department gratefully withdrew from politics.

By 1935 Texas was "out of the mud." Paved primary highways linked all major Texas cities, although the state's farmers and ranchers still had to struggle with dirt roads which turned into morasses of mud whenever it rained. Today's vast Farm to Market Roads System was nonexistent.

For two years, from 1933 to 1935, Duval had served as Assistant Resident Engineer in Travis County. In this capacity he worked to get Congress Avenue in Austin extended south in a straight line as far as possible. This was to create the view of the State Capitol which motorists currently enjoy as they drive into Austin from the south.

In 1935, back in the main offices of the Department, he was given the task of setting up a control system for all highway projects. He was given three months to set the system up and get it into operation.

Setting up the control system meant picking up 12,000 projects dating back to the Department's birth in 1917. It was in operation at the end of the three-months deadline, but Duval stayed with the system for ten years. After the first two years, he and the control system were moved to the Financial Section of Highway Planning Survey under Ray Faltinson, now head of D-21. The control files are now kept in the basement of the State Highway Building under the direction of D-21. Since 1945 Duval Jarl has handled these files, which contain an exact description of every project ever done by the Highway Department.

In 1945 Duval moved into Highway Design where he worked under the Assistant Road Design Engineer, Ramsey Davis. One of his associates was J. D. Rice, who is now with the U. S. Bureau of Public Roads. Rice and Duval were each assigned half of the state in highway design.

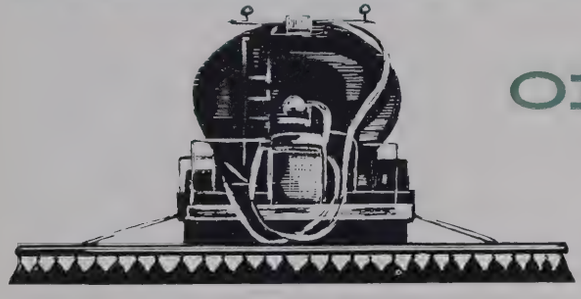
While in this division, Duval aided in injecting the principle of automation into the area of specifications. He helped develop a coding system which utilizes magnetic tapes and computers, and can provide an answer in a few minutes that would take a man three weeks to complete. Duval himself was one of those who were most happy to see this system in operation. "Before that, I used to spend a month sometimes working up answers," he said.

For the past decade, Duval has been Senior Designing Engineer. Always active in professional organizations, he is past president of the Travis Chapter of the Texas Society of Professional Engineers; a member of the National Society of Professional Engineers; Texas Public Employees Association; Ramshorn Club (the engineering club of the University of Texas); The University of Texas Ex-Students Association; World War I Veterans; the American Legion; and is past president of the Veterans Association of Government Employees.

At the end of a lifetime in the field of highway engineering, Duval, with wife Helen May and daughter Kathy Gail, intends to enter a new field. Always a devoted outdoorsman, Duval will operate a ranch near Dripping Springs where he can hunt and fish to the heart's content.

His departure from the Highway Department leaves an irreplaceable gap in the historical memories of the organization. He was one of the last of the highway pioneers—the end of an era in the story of Texas highways.

transverse distribution of liquid asphalt materials



Joe S. Gresham, District Construction Engineer
District 14

Great care is exercised in securing the specified longitudinal rate of distribution of asphalt on penetration surfaces, seal, and tack coats. However, I think we have been more or less assuming or hoping that the transverse distribution is correct within reasonable limits unless it is so far off as to be visibly apparent.

At various times in the past we have tried several means of checking this distribution with buckets, pressure gauges, troughs, and other methods. Most of these checks were difficult to perform, not too conclusive, and delayed work enough to irritate the contractors and possibly our own personnel.

Under heavy traffic, unfavorable weather conditions, and with wider application widths, job results have indicated that the variation in application transversely is, in many cases, beyond tolerable limits. Indirectly this affected our design, because when excessive bleeding occurred—especially when the heavy portion of the application coincided with traffic lanes—the tendency was to reduce the application rate on succeeding jobs.

To correct this, we have been employing a test which is accurate, can be made with a minimum of effort and equipment, and which causes little delay of the work. Briefly, it requires the placing of an additional strip of the paper used in making joints at the beginning or end of the shot, or both. It may also be used at any point within the shot although this involves hand spraying the bare spot after the test paper is removed. The paper should be tacked down on the edges to prevent asphalt running under. After the application of asphalt is made, the paper is cut into equal sections approximately 24 inches wide, identified as to the portion of the bar they represent, and each weighed on a torsion balance ordinarily available in field laboratories. To insure greater accuracy, four to six inches of the outside edge is cut off and the remainder of the strip cut into equal sections approximately 24 inches in width. The results obtained from weighing, deducting the weight of the paper, may then be recorded in grams per section or calculated in gallons per square yard for each section of the bar.

At present we have arbitrarily set a maximum allowable variation of 10 per cent from the lightest to heaviest section of the bar, as satisfactory. As contractors and manufacturers find means of correcting the uneven distribution, this variation should be reduced.

A limited number of tests by this method indicate that most distributors apply up to ten- or twelve-foot widths within the 10 per cent limit. From twelve to twenty feet the variation approaches 20 per cent, and over twenty feet the variation may exceed 20 per cent—this without any corrective measures having been taken.

When variations exceed 10 per cent, at the width the contractor elects to apply the asphalt, he is given the option of applying a narrower width or of correcting the distribution. Sometimes, as was the case with one of our state distributors, we were unable to make satisfactory corrections, especially over twenty-foot widths, and are confining our applications to twelve-foot or less widths. The correction usually involves the following:

(1) Checking, and overhauling if necessary, the pump motor, pump, supply lines, spray bar, valve linkage, and nozzles.

(2) Increasing pump pressure or substituting smaller nozzles.

(3) Using smaller nozzles on the center half of the bar and slightly larger ones on the end quarters of the bar. The pattern shown by the test will indicate where nozzle changes are necessary.

If these checks were consistently made on each job, and handled like the calibration sheet which accompanies the distributor, distributors would soon arrive on the job with proper nozzle sizes and pressure indicated for the various application widths.

It appears, also, that if this test, or some other equally as effective, were made for a time on a state-wide basis, contractors would insist on improved design in this phase of distribution, and the problem would be more or less eliminated except for occasional routine tests.

We feel that this phase of distribution is highly important in the quality of work obtainable and that all concerned should give more thought and attention to the solution of the problem.

Traffic Growth in Urban Areas*

J. E. Wright, Traffic Survey Manager
Planning Survey Division

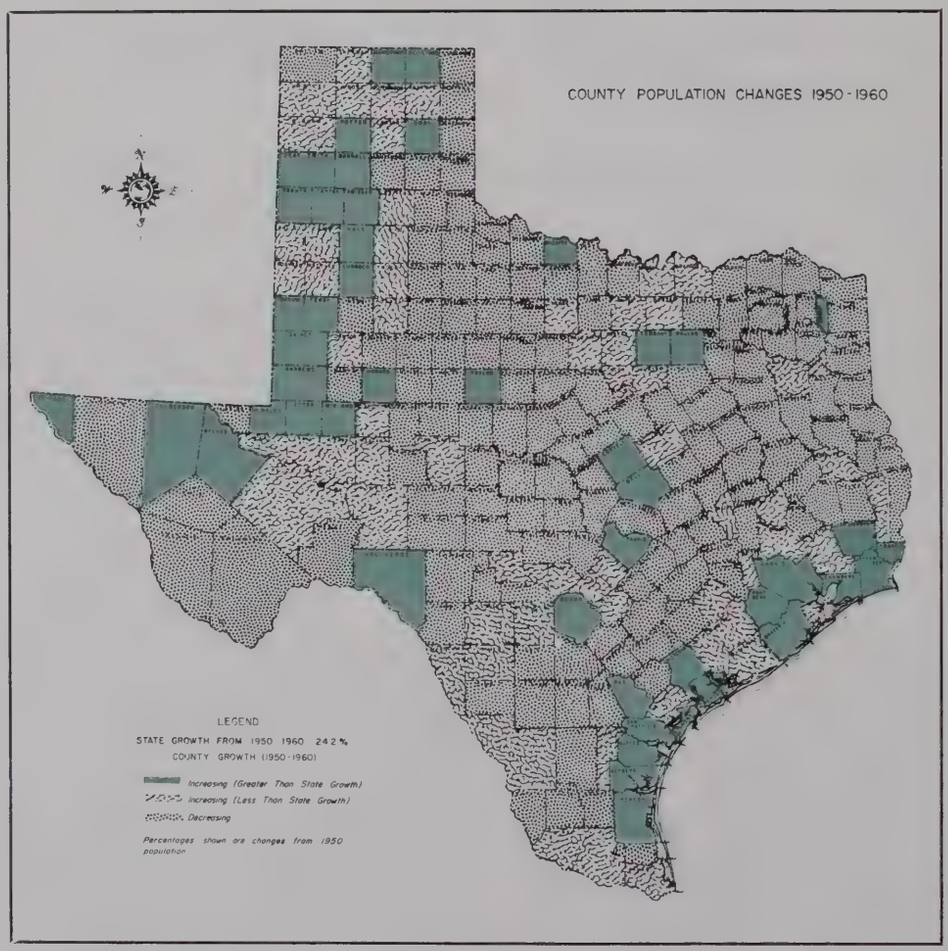


Figure 1

To be able to discuss the subject of traffic growth in urban areas, it would be appropriate to first look into the basic reasons underlying this growth. Actually it is not only the over-all growth that is of concern, but it is the resultant change in areas of development and allied traffic patterns and volumes that are brought about by this growth. It seems necessary, then, to have a clearer understanding of what has been happening in urban areas and just what these trends are leading to.

In the past decade, 1950 to 1960, the population of the Nation increased by approximately 26½ million people. About 7 per cent of this increase occurred in Texas. Ninety per cent of the population increase occurring in the United States since World War II has centered in 170 metropolitan areas. Today, approximately two-thirds of the people in the U. S. live in cities of this size. According to studies made by the Urban Land Institute, this figure will be close to 75 per cent in the next ten years. By the year 2000 it is estimated that some 85 per cent of our 320 million population will live in urban areas. These prospective population increases clearly point up the dimen-

*Speech presented at 1961 Highway Short Course.

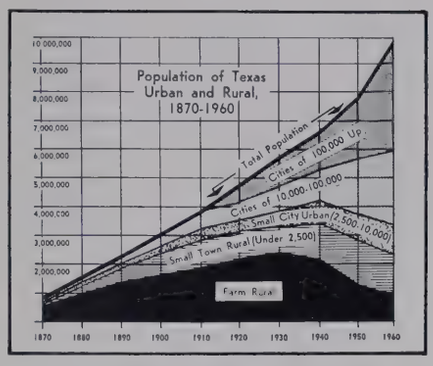


Figure 2

sions of the transportation job that lies ahead. The key consideration from the transportation standpoint, however, is not only how much these urban areas will grow but in what pattern they will develop.

Increasing use of the automobile and the growing number of automobiles operated are bringing major population shifts, the relocation of industry, the creation of new services and facilities oriented to the demands of the automobile and countless other changes directly or indirectly related to the growing needs of a private transportation system. Added to the problem is the resultant decline of public transportation facilities.

Some of these changes are occurring so rapidly and with such impact that many communities are taken unawares, not realizing the far-reaching influences already at work to both their advantage and disadvantage.

Texas now has a population of 9,579,677 persons as compared to 7,711,194 in 1950. This is a 24 per cent increase in the past ten-year period. The distribution of this population in 1950 was 63 per cent urban —37 per cent rural. In 1960 the urban population has increased to 75 per cent of the total, leaving only 25 per cent in rural areas. Urban population increased 2,347,951 persons in the last ten years as compared to the over-all state increase of 1,868,483 persons. Rural areas lost 479,458 persons. It becomes obvious, therefore, that the cities of Texas have received all of the population increase of the past decade and have also caused a substantial relocation of people from farms to cities. This shift of people from rural areas to the cities is not, however, a phenomenon peculiar to the 1950's. Actually, the trend dates back to about 1930. The farm population of the state reached its peak of around 2,400,000 people in 1930 and has been declining since. We, therefore, have living in and around cities, towns, and villages of Texas, over 8½ million people today. This figure contrasts with a population of 3½ million who were living in the cities, towns, and villages or under urban conditions in the state in 1930. The urban growth of our state has been highly selective. Not all cities have gained population and yet some have experienced enormous gains. The larger urban counties, such as Tarrant, Dallas, Bexar, and Harris, have accounted for an increasing amount of the state's growth. In 1930 these four counties represented about one-fifth of the population of the state; today they represent over one-third of the state's population. Figure 1 shows the per cent change of population in each county of the state between 1950 and 1960. One hundred forty-two counties lost population, 67 counties had an increase in population less than the over-all state growth of 24 per cent and 45 counties increased at a greater rate than the total state growth. Even in those counties which lost population, the major urban centers tended to gain. Kaufman County lost 1,240 people between 1950 and 1960 while Terrell, one of its principal cities, gained 2,000 people. Ellis County lost 2,500 people in the last decade, while Waxahachie and Ennis gained 2,800. The major population explosions have been in the suburbs of the four larger metropolitan areas in Texas, with bedroom cities such as Irving jumping from 2,600 to 45,000 in ten years. An overlay of traffic volumes on the rural highway system indicates quite clear-

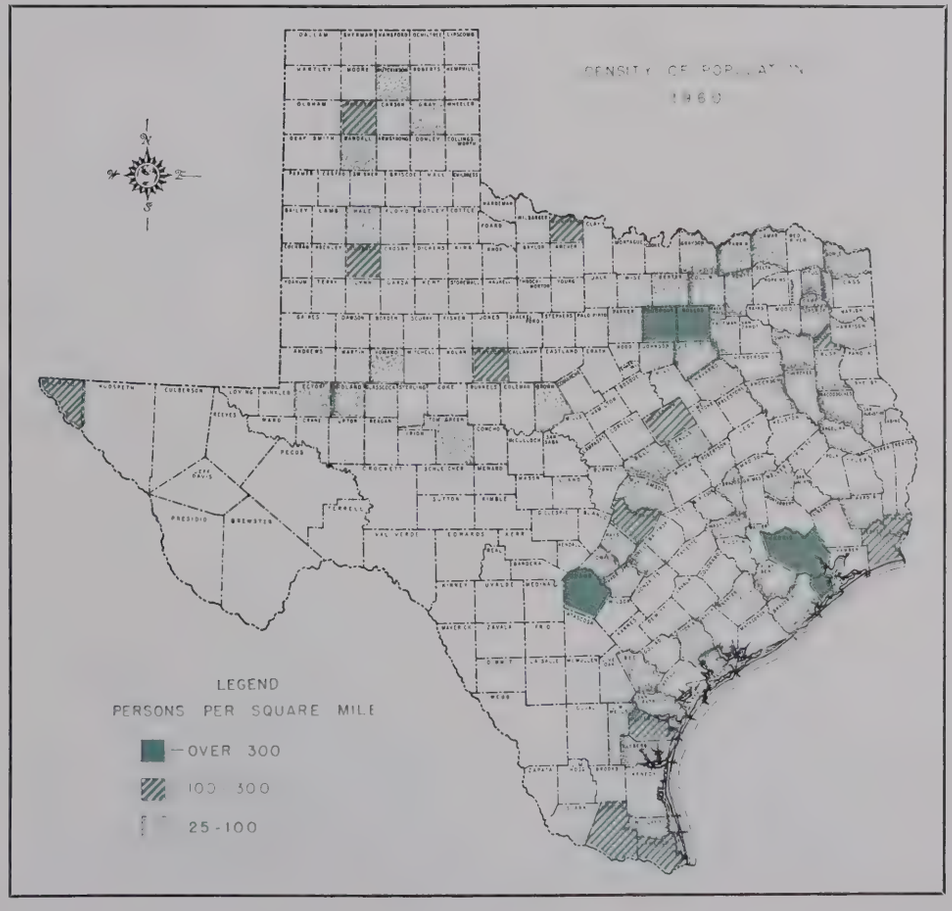


Figure 3

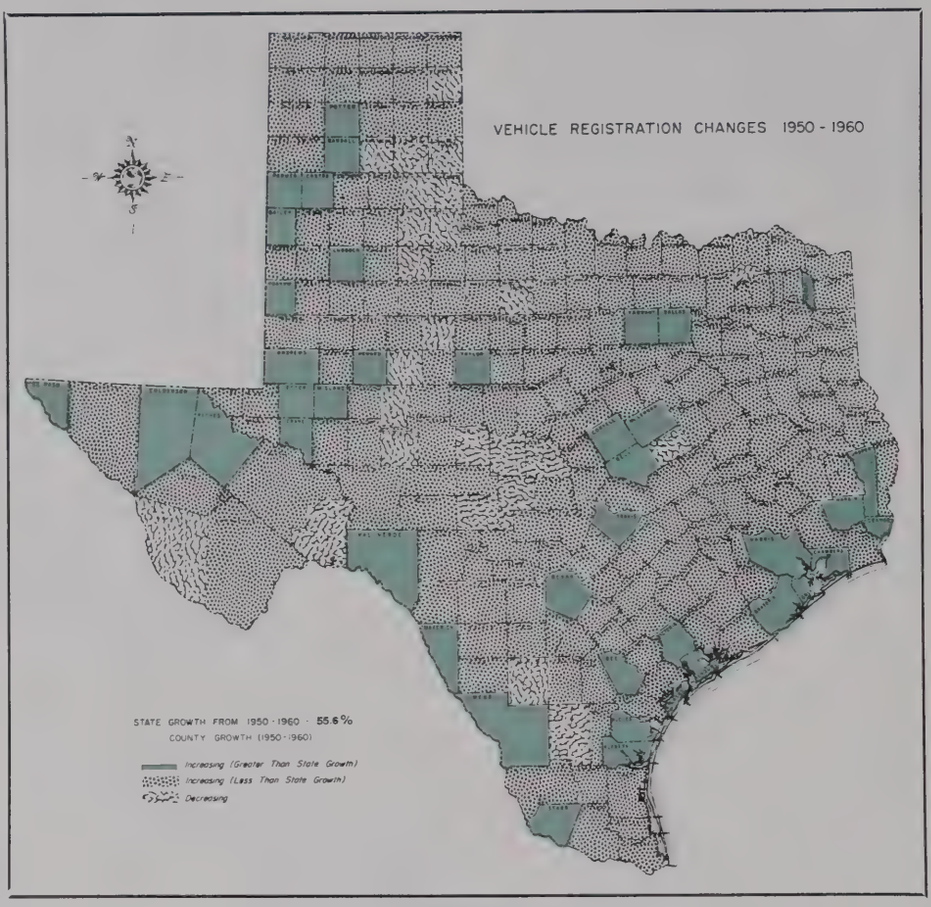

VEHICLE REGISTRATION CHANGES 1950 - 1960
STATE GROWTH FROM 1950 - 1960 : 55.6%
COUNTY GROWTH (1950 - 1960)
Increasing (Greater Than State Growth)
Increasing (Less Than State Growth)
Decreasing

Figure 4

ly the tremendous build-up of traffic in these same areas where population is increasing at the greatest rate.

The growth and shift of population in Texas, from 1870 to 1960, is shown in Figure 2. The very definite trend toward urbanization starts in 1930 and increases rapidly from 1940 to 1960.

In 1950 only one county in Texas had a population density of over 500 persons per square mile. In 1960 there were four counties exceeding 500 persons per square mile with one county exceeding 1,000 persons per square mile. Figure 3 shows the density by counties and again a pattern similar to the population increase distribution is formed. The average density (population per square mile) over all Texas in 1950 was 29.3, as compared to 36.4 in 1960. This is considerably below that of the United States, however, on the basis of comparative natural wealth Texas should eventually have a greater density of population than that of the United States as a whole.

HOUSTON TRANSPORTATION STUDY

COMPARISONS OF BASIC DWELLING UNIT DATA

	Persons Per Dwelling Unit	Autos Owned Per Dwelling Unit	Total Trips Per Dwelling Unit	Auto Trips Per Dwelling Unit	Total Trips Per Person	Auto Trips Per Person
1953 Study Total Area	3.4	.94	7.2	3.8	2.2	1.17
1953 Study Test Tracts Only	3.2	.96	7.7	4.5	2.4	1.42
1960 Study Test Tracts Only	2.8	1.07	7.0	4.3	2.5	1.53
1960 Study New Area Only	3.1	1.2	8.1	5.1	2.6	1.64

Table 1 Showing relation of persons, dwelling units, automobiles and trips by various areas for 1953 and 1960

Figure 5

Vehicle registration in Texas has increased from 3,084,941 in 1950 to 4,800,389 in 1960. This is a 56 per cent increase in ten years. Figure 4 shows the per cent change of vehicles registered in each county during the last ten years. It is of interest to note that only 25 counties had fewer vehicles registered in 1960 than in 1950, even though 142 counties lost in population. One hundred ninety counties showed increased vehicle registration but at a lower rate than the over-all state increase of 56 per cent. However, there were 39 counties with a greater increase in vehicle registration than the state average and these counties form a very similar pattern to the 45 counties that had the greatest increase in population. This again points to the above-average growth of urban areas and its attendant effect on traffic growth and related problems in these areas.

Total vehicles per capita in 1950 was .40, but in 1960, this figure had increased to .50. Automobiles accounted for 66 per cent of total registration in 1950 and 71 per cent in 1960. This indicates an increase from .26 automobiles per person in 1950 to .36 in 1960, an increase of .10 automobiles per person in ten years.

There are also factors, other than population and vehicle growth, that are affecting urban traffic. The number of total person trips per day and the number of vehicle trips per person per day are increasing.

Studies conducted in Houston during 1960 furnished data which made

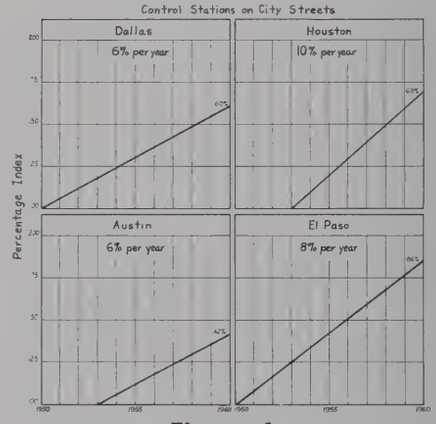


Figure 6

possible a direct comparison with travel trends found in that area in 1953. Figure 5 shows the relationship of persons, dwelling units, automobiles owned, and trips, for various areas in the Houston complex for 1953 and 1960. It is of interest to note that persons per dwelling unit in the central and older area of Houston are declining while in the new suburban areas persons per dwelling unit have in-

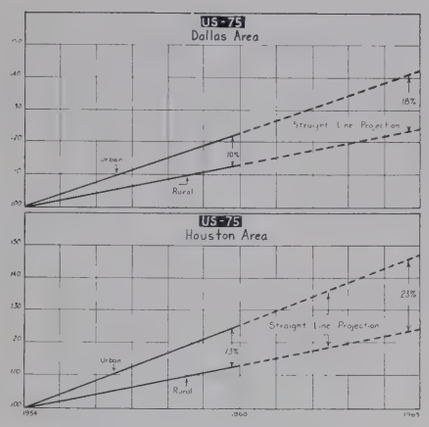


Figure 7

creased. Similarly there are more automobiles per dwelling unit in the new areas of development. Automobile trips per person have shown an increase of 1½ per cent per year for the past seven years in the Houston area. In the more fully developed areas there are now 1.52 automobile trips per person, while in the suburban areas, this figure increases to 1.55 trips per person per day.

The combination of (1) the increase in population, (2) the shift of this population to urban areas, (3) the increase of vehicle registration, and (4) the increased usage of the automobile, develop a factor of tremendous increase in traffic volumes on urban facilities.

Figure 6 shows some examples of the growth of traffic volumes from 1950 to 1960 on city streets as measured by continuing control station counts at representative locations within these cities. Houston shows the greatest increase which amounts to almost 10 per cent per year. Dallas and Austin show a 6 per cent increase per year. El Paso gained over 8 per cent per year. These are seven to ten-year averages and do not necessarily indicate a consistent yearly gain but merely show the yearly average for the period.

Figure 7 shows the difference in rate of growth between rural and urban sections of U. S. 75 in Dallas and Harris Counties during the 1950-1960 period. U. S. 75, between 1954 and 1960, in Dallas County increased 23 per cent in the urban area and only 13 per cent in the rural area. This same facility in Harris County increased 26 per cent in the urban area and 13 per cent in the rural section. This indicates in Dallas a 10 per cent and in Houston a 13 per cent difference in the rate of the growth of the same facility in rural and urban areas. The straight-line projections of these data, shown for comparison purposes only, clearly indicate what can happen in only five more years.

Figure 8 shows the hourly distribution of inbound and outbound traffic on U. S. 75 in Dallas for 1949, 1954, and 1959. Here in detail is the growth by hour periods of traffic volumes on an expressway as the facility was developed through the area.

Contrary to some opinions and forecasts of only a few years ago, the central business districts of our larger metropolitan areas in Texas are not losing their power of vehicular trip attraction. Recent studies indicate a continuing growth of these downtown areas, but this growth has been and seemingly will continue to be relatively small in comparison with the over-all growth of the entire metropolitan area.

The volume of travel oriented to downtown areas continues to be relatively large, but this volume represents a declining proportion of the travel in the total area. This trend is one of the causes of changing patterns in areas that have been discussed previously. Cross-town movements may now develop into greater problems than the one-time downtown loads that were considered the major problem of the area.

Viewed from another standpoint, and using Houston as an example, it is clear that the factors of influence in the central business districts cannot be overlooked. Houston had a 68 per cent increase in floor area of office space *in use* in the downtown area during the past ten years.

Data from recent studies in Houston show a definite increase in the daily accumulation of vehicles in the Houston Central Business District during the last seven years. In conjunction with this fact, and as part of the explanation, it was found that transit passengers to downtown Houston had decreased 36 per cent since 1953. Total daily transit passengers in the Houston Metropolitan Area have decreased more than 60 per cent in the past ten years. These trends showing the decline in transit riding offer some explanation for the opposite trends found in car ownership and vehicle trips per person.

Another central city area with tre-

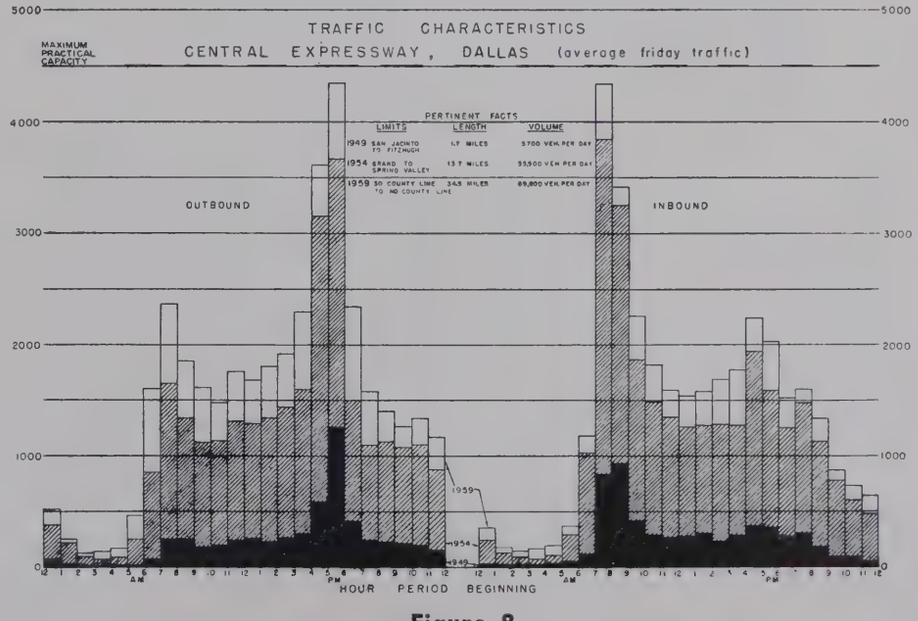


Figure 8

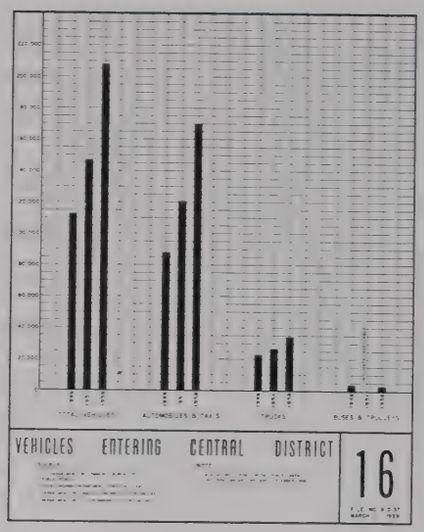


Figure 9

mendous growth in the past decade is downtown Dallas. Figure 9 shows a comparison of the number of vehicles entering the Dallas Central Business District in 1946, 1951, and 1958; a total gain of 85 per cent—or an average of over 7 per cent per year. Figure 10 portrays the 1946 and 1958 comparison of daily vehicles accumulated in the Dallas Central Business District. In 1946 maximum accumulation was 13,000 vehicles. In 1958 maximum accumulation had increased to 39,000, a 200 per cent increase.

The total number of persons entering the Dallas core area daily increased about 10 per cent in the twelve-year period (1946-1958), yet the number entering by automobile increased nearly 70 per cent. Those entering by transit decreased by more than 40 per cent. This again portrays the significance of the automobile as the primary means of conveyance for people in urban areas.

Another indicator of the increasing traffic growth in urban areas is the disbursement of funds for streets and highways. Figure 11 shows the total expenditures by cities for street construction, right of way, and other related activities during the period 1949 to 1958. This is an increase of 141 per cent, or 16 per cent per year. Adjusting these figures by the cost index as developed from Highway Department expenditures, a total increase of 80 per cent—or 9 per cent per year—is indicated.

Texas Highway Department expenditures on urban construction increased from 18 to 25 per cent of total construction funds between 1950 and 1960. Approximately 31 per cent of current Highway Department construction contracts are in urban areas.

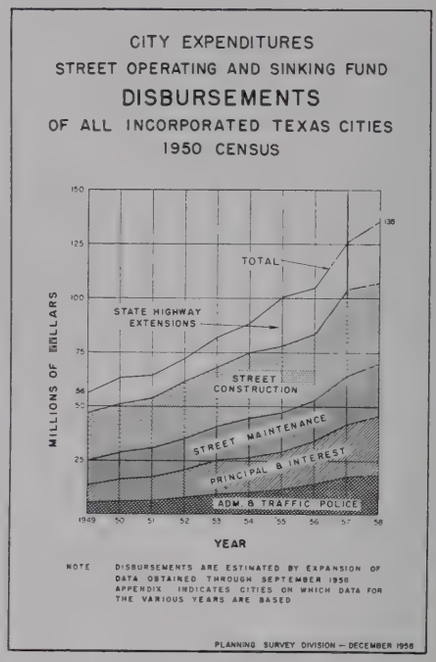

CITY EXPENDITURES
STREET OPERATING AND SINKING FUND
DISBURSEMENTS
OF ALL INCORPORATED TEXAS CITIES
1950 CENSUS
MILLIONS OF DOLLARS
TOTAL
STATE HIGHWAY EXTENSIONS
STREET CONSTRUCTION
STREET MAINTENANCE
PRINCIPAL & INTEREST
ADM. & TRAFFIC POLICE
YEAR
NOTE DISBURSEMENTS ARE ESTIMATED BY EXPANSION OF DATA OBTAINED THROUGH SEPTEMBER 1958 APPENDIX INDICATES CITIES ON WHICH DATA FOR THE VARIOUS YEARS ARE BASED
PLANNING SURVEY DIVISION — DECEMBER 1958

Figure 11

In conclusion it might be well to emphasize certain facts relating to urban traffic growth.

1. The population of Texas has increased 24 per cent in the past decade.
2. Seventy-five per cent of this population is now in urban areas, and the trend from rural to urban living is still predominant.
3. Vehicle registration has increased 56 per cent in the last ten years.
4. Daily vehicle trips per person are increasing each year.
5. People generate traffic and the concentration of these people in urban areas constitutes the major generators of traffic in the state.

The tremendous increase in population forecasts for urban areas in the future, along with the increasing use of the automobile and the decline in public transportation, leads us to believe that urban transportation constitutes one of the greatest socio-economic problems of the times.

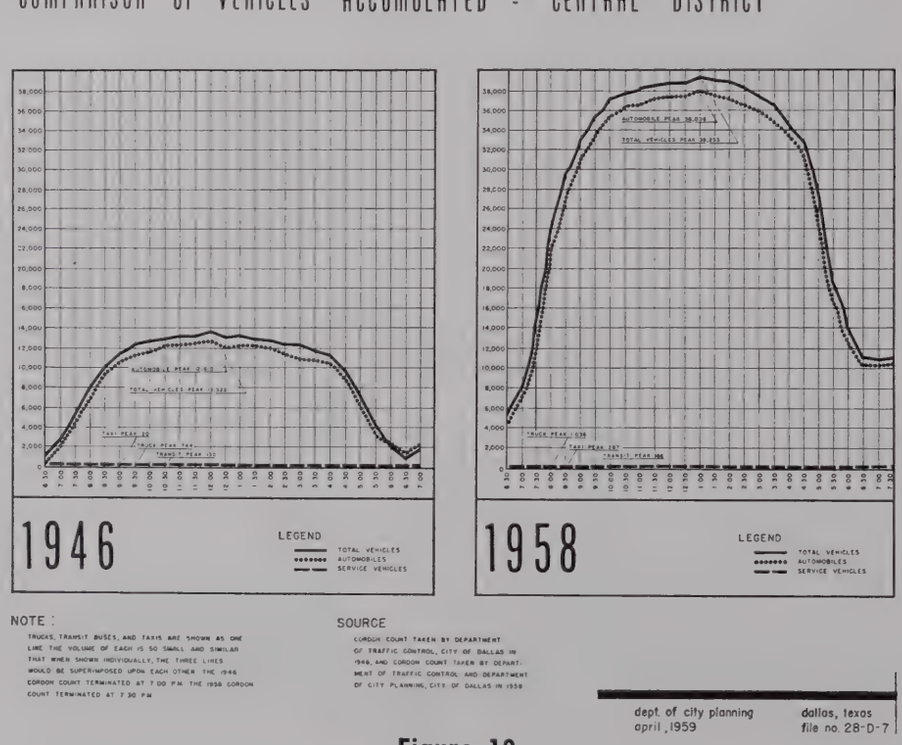

COMPARISON OF VEHICLES ACCUMULATED - CENTRAL DISTRICT
1946
LEGEND
TOTAL VEHICLES
AUTOMOBILES
SERVICE VEHICLES
1958
LEGEND
TOTAL VEHICLES
AUTOMOBILES
SERVICE VEHICLES
NOTE :
TRUCKS, TRANSIT BUSES, AND TAXIS ARE SHOWN AS ONE LINE THE VOLUME OF EACH IS SO SMALL AND SIMILAR THAT WHEN SHOWN INDIVIDUALLY, THE THREE LINES WOULD BE SUPERIMPOSED UPON EACH OTHER THE 1946 CORDON COUNT TERMINATED AT 7:00 P.M. THE 1958 CORDON COUNT TERMINATED AT 7:30 P.M.
SOURCE
CORDON COUNT TAKEN BY DEPARTMENT OF TRAFFIC CONTROL, CITY OF DALLAS IN 1946, AND CORDON COUNT TAKEN BY DEPARTMENT OF TRAFFIC CONTROL AND DEPARTMENT OF CITY PLANNING, CITY OF DALLAS IN 1958
dept. of city planning
april, 1959
dallas, texas
file no. 28-D-7

Figure 10

MOBILE SERVICE TRUCK

PM

N. D. Cardwell, Equipment Supervisor
District 2

District 2, concerned with cutting costs by means of preventive maintenance, recently made a survey and came up with the following facts.

A study of heavy-duty equipment far from maintenance headquarters established that these pieces of equipment ranged in value from $15,000 to $22,000 each. They consisted of loaders, both track and wheeled, and 35 motor graders—a sizable investment estimated at $750,000. Repair parts on this type of equipment are very expensive.

Greasing at frequent intervals is necessary for continued operation. Daily servicing by operators was evident, but the equipment needed supplemental servicing with a regular change of oil in the motor, transmission, torque converters, rear differential drive, and oil-filter elements. This is in addition to chassis lubricants. Tire changing on this equipment presented a problem, as too often tires were run past the proper time to recap.

Air pressure is checked.

Our mobile service truck was designed to help eliminate many of these problems. It goes to the location of the units and quickly services them with a minimum of interference to the functions of the equipment.

Air wrench is used to mount grader tire.

It was necessary to equip the truck with an air compressor to supply power for five pumps for five kinds of grease, two heavy-duty grease pumps, and three oil pumps. The grease truck has six reels for handling the hose lines of grease, oil, and air service. The air compressor has an outlet at the tank that operates an air wrench and air hammer for dis-

A roller is greased in the field.

mounting and mounting the large grader tires.

Installed at one of the rear corners of the bed of the truck is a hand-operated hydraulic lift to raise and lower tires, wheels, and oil drums. This lift has a capacity rating of 2,000 pounds and will swing in a 360-degree arc, making it very easy to load or unload objects on other vehicles.

The grease truck has facilities that make it possible for the operator to perform many varied services in a maintenance section. The operator carries a stock of oil-filter elements, grease fittings, and allied repair parts. He is required to change all diesel-powered oil elements, fuel elements, and, with the cooperation of the equipment operator, to keep the equipment running smoothly if it needs only minor adjustments. The operator keeps a record of all oil, grease, and items used on each piece of equipment. He makes a notation on the issue form of the hour, meter, or mileage of the speedometer.

We have operated for a period of eight months, and have found that it takes about one full day to service one maintenance section. We have ten sections, so this means that about every ten days the equipment is thoroughly checked and greased. The average number of different pieces of equipment serviced in one month is

The hydraulic lift is used to load grader tires.

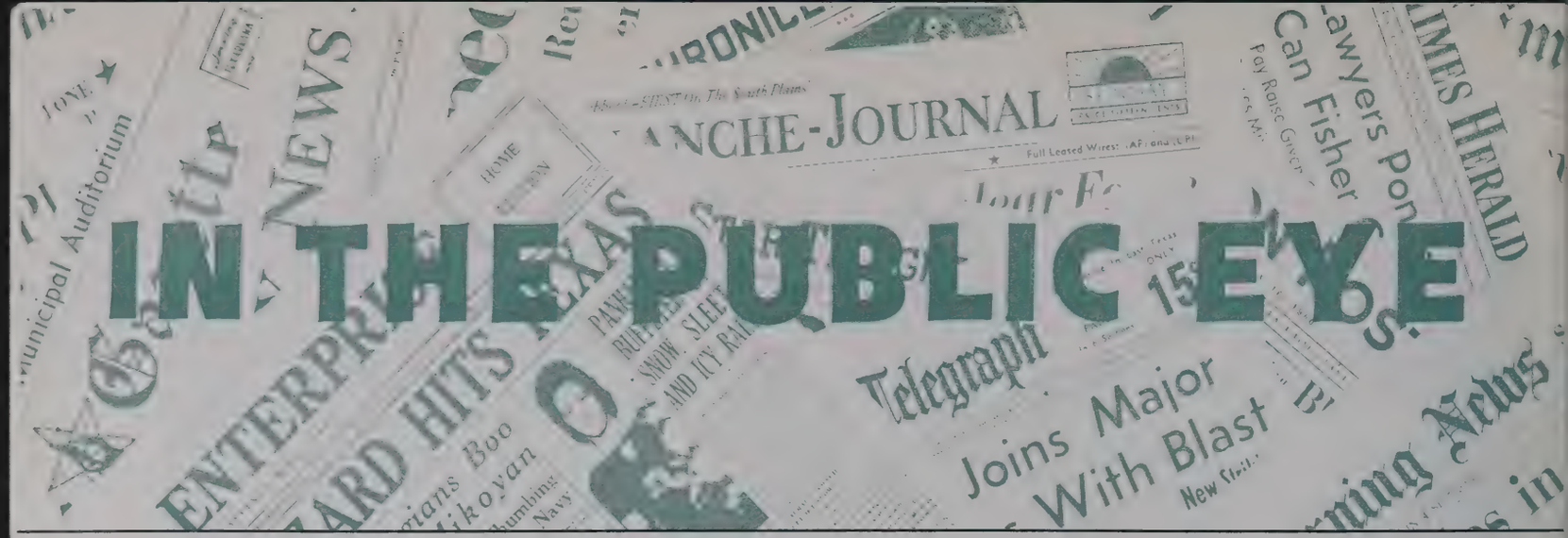
60, and they are serviced two to three times monthly.

Our records show we have issued monthly:

30 oil filter elements
14 grease fittings
825 quarts motor oil
450 pounds chassis lubricant

Equipment is serviced in the field.

We believe that continuance of this program for one year will result in a saving in repair parts up to 25 per cent. Close records are being kept on equipment for comparison with past repairs. We feel that these records will substantiate our enthusiasm over this preventive-maintenance program.



DEADLINE DETOUR?

McKinney Courier-Gazette, on the interstate highway system—"With the total price tag for the program having already been boosted several times to cover rising costs, the judgment is that the 1972 deadline can't be met from presently authorized revenue sources. Completion would have to be stretched out to 1977.

"About 10 states, including New York, Ohio, Texas, California and the Dakotas, are sufficiently advanced in planning to put the money quickly to use. Here and there, contract letting may also be speeded. But in many areas the money can't be handled now. Already allotted funds are backed up, waiting for plans."

TURN ABOUT

Waco Times-Herald, putting its two cents in on continuance of the 4-cent gasoline tax—"Morally the gasoline tax should go to the support of the highways. In recent years, however, parts of this tax have been diverted to other users, a clear betrayal of early promises that all of the gasoline tax yield would go to building more and better highways and maintaining them."

A LEGALIZED 70?

Waco Times-Herald, editorially—"Authority to zone all highways, roads, and streets for maximum and minimum speed limits and to raise the present 60-mile top limit to 70 on highways, has been approved by the Senate. The measure still requires adoption by the House and signature of the governor to become law.

"The Highway Department would be given zoning power over all highways, an authority which it already exercises on many types of major highways."

CHECKED OUT

Aransas Pass Progress, reports that—"The ferry H. C. Petry Jr., has passed Coast Guard inspection and is due to be placed in service soon transporting vessels across the ship channel between Harbor Island and Port Aransas."

SIGNS OF SAFETY

Temple Telegram, noting instigation of a traffic-safety program at all school-highway trouble spots in Temple—"City officials were instructed to write Waco District Highway Traffic Engineer Ed Smith of Waco immediately requesting a complete set of recommendations on school signs, speed zones, lights or whatever methods are needed to achieve maximum safety for children.

"Commissioners were told that the Highway Department would build signs needed, take down the signs in summer when school was out, paint them,—do everything necessary to promote safety."

Borger News-Herald, announcing merit award presentations from Governor Price Daniel to cities without traffic deaths in 1960—"Personnel of the Texas Highway Department and State Highway Engineer Dewitt C. Greer received commendation for 'their cooperation in designating, designing, and constructing multimillion dollar highway betterment and safety projects during the past three years. And for supervising the expenditure of nearly $70 million on the projects to make Texas highways safer.' "

ILLUMINATING FACTS

Waco Times-Herald, plugging for highway lighting—"A national committee is urging that the next big step toward traffic safety be the lighting of highways and roads and better lighting of city streets.

"The 'committee on highway illumination' has pointed out the established fact that the ratio of traffic accidents and fatalities is higher at night than in daylight hours.

". . . highway illumination would save lives and save money."

A COSTLY TOSS

Sherman Democrat, in a feature on litterbugging—"Texas motorists toss thousands of highway dollars out of their car windows each year.

" 'We like to think our visitors are the ones scattering the trash,' [State Highway Engineer D. C.] Greer stated, 'But by and large it is Texas people who are littering the highways. Our litterbugs spawn at home.'

"Greer added that litter bags distributed through Texas Information Stations did some good. 'But here we reach only the tourists,' Greer said, 'The worst offenders, our own citizens, are not affected.' "

IN THE COMMUNITY

Wichita Falls Times, noting that—"Frank L. Ragland, maintenance engineer for the nine-county Wichita Falls District of the State Highway Department, has been named chairman of the Red Cross disaster survey committee for Wichita County."

District 5's

1960 maintenance contest

Winners of the 1960 Maintenance Contest in District 5 were announced in January by District Engineer O. L. Crain.

Weaver Patterson, Senior Maintenance Foreman at Seminole, was recognized for the greatest improvement in his section during the past year.

Cornelius McMahan, Senior Maintenance Foreman at Muleshoe, was first-place winner in the contest, and second place went to H. B. McMullen, Senior Maintenance Foreman at Lamesa.

District Engineer O. L. Crain, center, poses with first-place winner Cornelius McMahan, and Weaver Patterson, who tied for third place, and who was recognized for greatest improvement in his section.

Tying for third place were H. G. McDonnell, Senior Maintenance Foreman in Plains, and Weaver Patterson.

In the contests, between maintenance sections, a mark is given for any deficiency in the traveled surface of the road; three-quarters of a mark for deficiencies on shoulders, and one-half for other deficiencies. The men were graded only on items within the control of the maintenance foremen. Accounting errors were counted against the foremen in grading.

Purpose of the contest was, according to Crain, improvement through competition.

"We were gratified with the results of the Maintenance Contest this year, as it indicated a definite improvement in all of the sections," Crain stated.

Grading was done by Bruce Bryan, Maintenance Engineer, Joel D. Willson, Senior Maintenance Superintendent, and Crain. The plaque presented the winner was prepared by R. W. Breedlove of the District Sign Shop.

median barriers and safety

Charles W. Strayhorn, Assistant District Maintenance Engineer
District 15

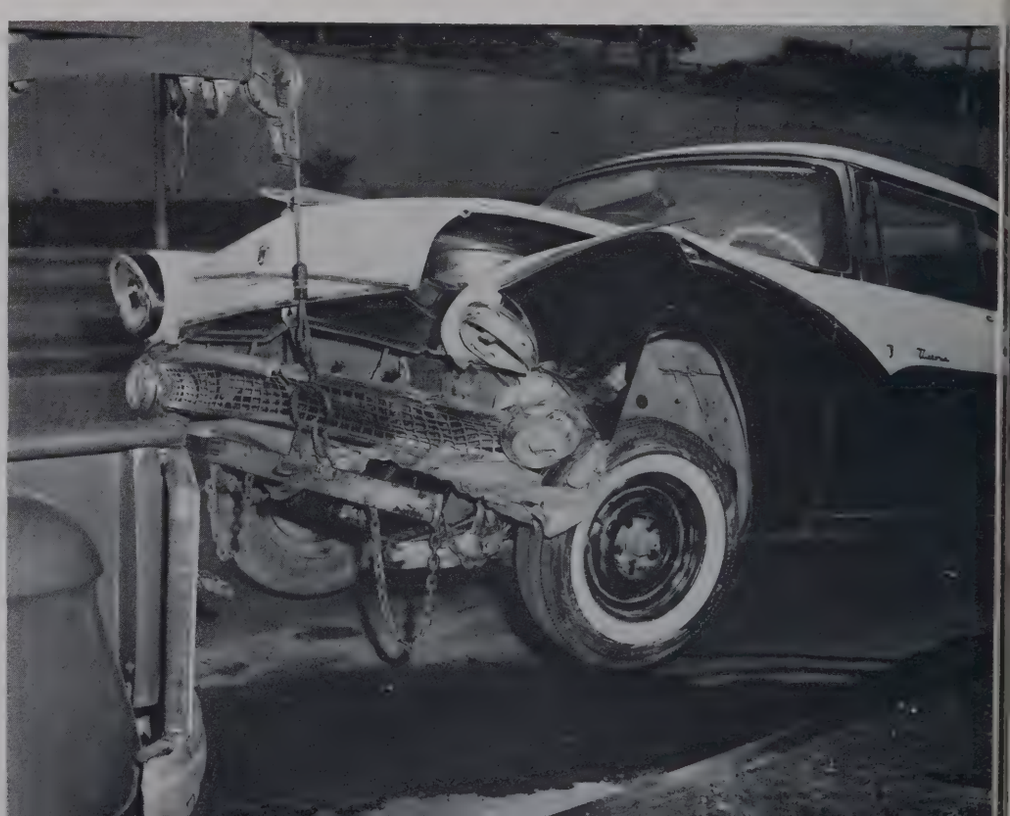
Two San Antonio wrecks on the morning of December 4 of last year would have been serious, and probably fatal, except for center median barriers on two Interstate Highways.

One accident occurred on Interstate Highway 10, on the south-bound lane of the expressway near Colorado Street. The center median barrier there, built by the Highway Department as Project Number C 72-12-22, was completed July 28, 1960, at a total cost of $15,400. It consists of flex-beam type railing made of aluminum mounted on seven-inch curb.

According to the police report, the driver stated that he was going south when suddenly the vehicle went out of control and crashed into the guard rail which separates the expressway lanes. The driver was also interviewed by Les Guthrie, now Associate Right of Way Agent, who was on hand with a camera, and the driver further stated that had it not been for the median barrier, he no doubt would have gone into the path of traffic coming from the opposite direction in the north-bound lane.

The driver was the only passenger in the vehicle, and he was not injured. No other vehicle was involved in the accident. Therefore, from the

Damage to the car looks bad from this accident on Interstate 10, but the median barrier, which prevented further damage from the car crossing into the opposite lane of traffic, fared better.

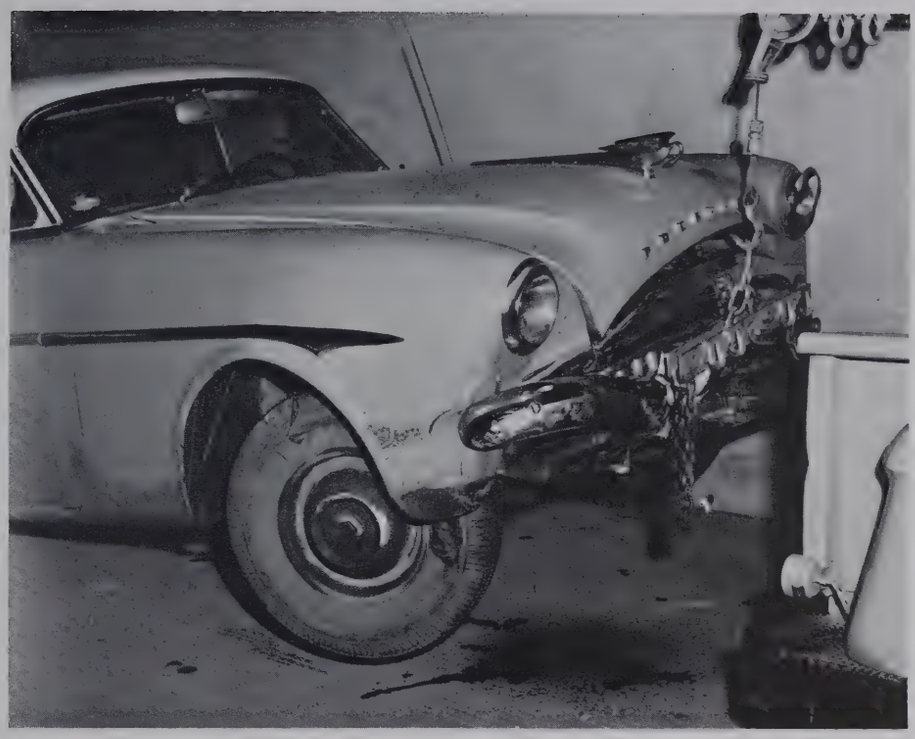


safety standpoint in the conservation of human lives, the median barrier definitely has justified the expenditure of $15,400 in the saving of at least one life in this accident. Had the rail not been there, this vehicle would definitely have gone into the oncoming traffic in the north-bound lane where other vehicles would have been involved and many other lives endangered.

The second accident mentioned happened on Interstate Highway 35, on the east-bound lane of the expressway at St. Mary's Street. Center median barrier along this route was built also by the Highway Department, Project Number C 17-10-33, and was completed at the same time as the other section. The median barrier here consists of five-inch steel pipe rail on top of twelve-inch curb.

Of this accident, the police report states that the driver says he saw an auto stalled on the expressway and when he hit his brakes, he was suddenly pulled into the guard fence that separates the east and west lanes of the expressway. According to Guthrie, who was also at the scene of this accident, the median barrier kept the car from going into the path of traffic coming from the opposite direction.

The driver was not injured. The only passenger riding in the car was his wife, who was thrown from the car and taken to a hospital. No other vehicle was involved in this accident. Therefore, from the safety standpoint, the $23,800-expenditure saved two lives, and prevented the endangering of other lives if the car had crossed the median into the other lane of traffic.



A sudden slamming on of brakes swerved this car into the median barrier on Interstate 35, extensively damaging the car, but again, the barrier was not seriously damaged.

A. T. Langford, Grimes County Maintenance Foreman, receives a Certificate of Merit from Joe G. Hanover, District Administrative Engineer.

Grimes County

Safety Record

W. J. Byford, Resident Engineer
District 17

A record to be proud of has been compiled by the Grimes County Maintenance Section of District 17 over a period of five years. From December 1, 1955, to November 30, 1960, this group operated for 317,740 man-hours without a lost-time accident. Through the safety and efficiency of this 26-man section, by the middle of February 1961, there still had been no lost-time accidents recorded.

A. T. Langford, Maintenance Foreman, was presented a Certificate of Merit by Joe G. Hanover, District Administrative Engineer, for outstanding accomplishment of his group. Through the cooperation of these men working together, accidents —costly to all concerned—have been avoided. Each man in the section contributed to this achievement.

Men of the Grimes County Maintenance Section pose with Langford, far left.

OVER THE HIGHWAYS

Comments . . . from the Traveling Public

• I would like to express to you my sincere conviction that Texas has some of the finest highways of any state in the nation. It has been my privilege to travel in many of our states, and nowhere have I seen better roads than in Texas.

Thomas G. Wilbanks
San Antonio, Texas

The following letter appeared in HOUSTON magazine.

• We have been intending to write to someone in Houston ever since we returned from our vacation in Texas. We have no complaints—far from it. We want to commend someone in Houston on how well the streets are marked for tourists following a route. We came through Houston at 8:30 on a week-day morning when traffic was heavy. I was driving in a strange town and the many route turns usually are very confusing to me. I found driving through Houston a pleasure. The way each turn is announced as you make each turn. It is so helpful to be told what lane to get into as soon as you turn onto a street. Will you please pass this letter on to whoever is responsible, with our sincere appreciation. If all towns and cities were marked as well—touring would be a complete pleasure.

Richard and Katherine Daniels
Lincoln Park, Michigan

• My husband and I spent the winter in California . . . and I want to tell you of our appreciation of your highways and roadside parks. We came into your state at a bad time, on December 10, but enjoyed both of the above as much as was possible under blizzard conditions along our route. Coming back through the state, we took a different route and had fine weather all of the way, arriving home on March 29. We took our time in your state this time.

I saw El Paso for the first time and think it is a beautiful city, and enjoyed the mountain scenery so much on our way to Carlsbad, New Mexico. That highway in those mountains is one of the best mountain highways I ever saw, and we took several pictures of the sights. . . . We saw two herds of antelope that same morning.

We used a number of your roadside parks and found them all to be nice ones. One that is outstanding in our memory is near the Red River on Highway 70. It is so pretty that we stopped there about 3 o'clock in the afternoon and spent the night so we could enjoy the beauty of it as much as possible.

My husband joins me in saying, "Hurrah for Texas."

Mrs. Paul J. Fleenor
Humansville, Missouri

• We disliked the 60 mile per hour limit. It should be 70 miles per hour in open country. We liked the condition of your highways.

Dubuque, Iowa

To: Personnel of the Highway Department at Ennis and Waxahachie

• We, The City Council of Italy, are most grateful to you for your kind assistance after the recent disaster that we experienced in our community.

Everyone has been so wonderful to us that we have realized to a much greater extent than we had in the past just what friends and neighbors mean to us in time of need.

Your immediate response to our need has been appreciated so very much and will be kindly remembered by the City of Italy.

Robert D. Windham, Mayor
Italy, Texas

• I recently took a trip across the U. S. and I must say to you whoever is in charge is to be congratulated on such good highways.

I found most of your farm roads are better than the major U. S. highways in most of the states I crossed. I got one ticket in Texas. The patrolman was so courteous it was almost a pleasure to receive the ticket.

I understand Alaska is Bigger than Texas; In fact, twice as Big.

Sfc James W. Jackson
Fort Riley, Kansas

To and From Our Readers

The largest secondary roads letting on record, dollarwise, was reported by D-14 in March.

Forty-four contracts were let, totaling $8,525,918—breaking the previous record set in April of 1958 amounting to $8,441,905 from 39 contracts. The May 1950 letting contained the largest number of contracts —54—of any one letting.

Keeping secondary roads in the limelight, the farm to market road system in Texas was 25 years old in April, and celebrated its birthday with a total of 34,000 miles to its credit. The first FM road, then known as a feeder or lateral road, was constructed between Mt. Enterprise and Shiloh in 1936, and was five and eight-tenths miles long.

The Highway Department received an award from Governor Price Daniel at a joint session, attended by 1,500, of the Texas Safety Conference and the governor's Highway Safety Commission in March. The award commended the Department for its safety endeavors.

Ways to decrease accident fatalities on Texas highways were discussed. The governor challenged the group to meet his goal of under 2,000 fatalities this year, but added that we were off to a bad start with more accidents than at the same time last year.

Speakers at the conference included the governor and Jim Musick, Executive Director of the Texas Safety Association.

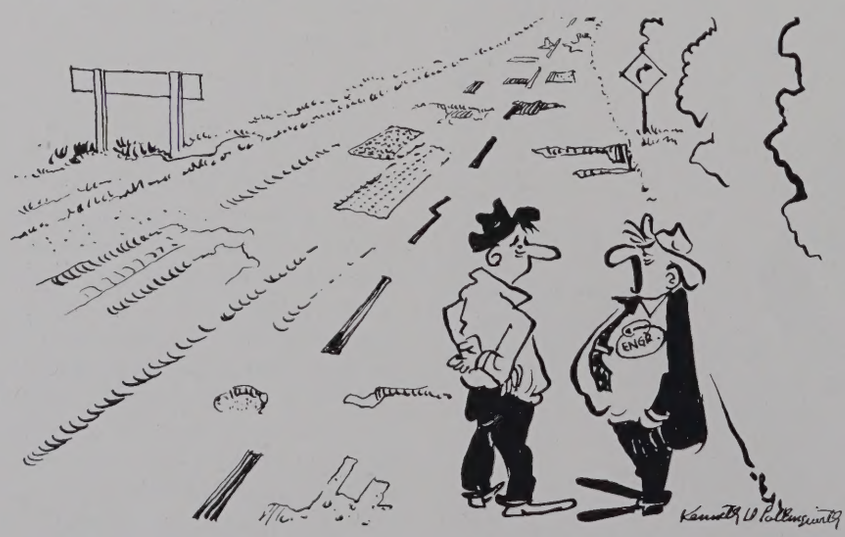
Talking on the subject of the three E's of safety were J. W. Edgar—Education; Tom H. Taylor—Engineering; and Homer Garrison—Enforcement.

The following item, entitled "Do You Mean Now or Then?" recently appeared in the Midland Reporter Telegram—"The Reporter-Telegram continually is asked to come up with answers to a wide variety of questions, and usually is able to oblige.

"But it was stumped Monday by a query from the Texas Highway Department concerning an area man who drowned last year in a boating accident.

" 'We would appreciate your furnishing us with the address of the deceased if you have it,' the letter said.

" 'If not, perhaps you could direct us to someone who could help us in the matter'."



"SAY, I'VE GOT AN IDEA... WE COULD PUT CONSTRUCTION SIGNS UP ON BOTH ENDS AND IT WOULD LOOK LIKE WE'RE DIGGING IT UP ON PURPOSE!"

About Our Pictures . . .

Our cover picture this month was made by B. C. Gersch, Senior Engineering Assistant in Bridge Division. The Houston skyline is seen beyond the steel rigid-frame bent rising as part of the Houston elevated expressway on Interstate 45.

Pictured inside the front cover, is a yucca in bloom alongside U. S. 183 about four miles north of Cuero.

On the opposite page is the proclamation signed by Governor Price Daniel designating Highway Week in Texas. President Kennedy has also signed a proclamation making May 21-27 National Highway Week.

TEXAS HIGHWAY COMMISSION

HERBERT C. PETRY JR.	Chairman
CHARLES F. HAWN	Member
HAL WOODWARD	Member
D. C. GREER	State Highway Engineer

Texas Highways

TEXAS HIGHWAYS, official journal of the Texas Highway Department, is published in the interest of highway development in Texas and for departmental education in the improvement of construction, maintenance, and operation.

TEXAS HIGHWAYS is available to the general public on a subscription basis at $3.50 annually, or it can be purchased for 35 cents a copy. Subscriptions, inquiries, material, or manuscripts should be directed to the Editorial Office, Travel and Information Division, Texas Highway Department, Austin 14, Texas.

Official Memorandum

By

PRICE DANIEL

Governor of Texas

AUSTIN, TEXAS

GREETINGS:

Nearly five million automobiles, trucks, and buses are registered in Texas for operation on its highways, streets and roads.

Development of the highway network reflects credit on the State Highway Department, the highway construction and maintenance industries, and the State-Federal partnership arrangement which has financed, built, and maintained it.

The Texas Highway Department, which began operations in June, 1917, is 44 years old this year. Texas now has 57,604 miles of State-maintained highways, with 3,024 miles of Interstate-highways presently allotted to the State.

Nineteen hundred and sixty-one is the fifth anniversary of the passage of the Federal Highway Act of 1956, which established financing and a schedule for 41,000 miles of interstate and defense highways designed to meet traffic needs for 1975. The act also stepped up the construction rate for the Federal-Aid Primary and Secondary Road systems.

Since its passage, Texas has led the Nation in miles of highways under construction and actually completed through the program. Nearly 880 miles have been opened to traffic, and 1426 miles are now under construction. Texas also leads all other States in primary, secondary, and urban highway mileage since the Federal Act was signed.

One-sixth of the American population depends directly on highways for a livelihood.

Direct benefits to the highway user of the construction of adequate highways have been estimated at three times their cost. This does not include the immeasurable benefits from improved traffic safety conditions and reduction of accidents.

The Congress of the United States during March designated the period of May 21-27 as National Highway Week and called on the President to issue a proclamation urging citizen support of better highways goals.

THEREFORE, I, as Governor of Texas, do hereby designate the period of May 21 - 27, 1961, as

HIGHWAY WEEK

in Texas and urge appropriate observance and special attention directed to needs of our highway system.

In official recognition whereof, I hereby affix my signature this 8th day of May, 1961.

Price Daniel

Governor of Texas